

OPERATING MANUAL

BTD-200

Accessory

Direction Finder



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1 HOW TO USE THIS MANUAL

The manual is organised so that if you read it from start to finish you will have a good understanding of how the Direction Finder operates, how it should be installed and how to use it. We realise however that different people will be involved in the installation and use of the system, so the following guidance is given.

The BTD-200 Direction Finder is an accessory of the BTD-200 Lightning Warning System, before attempting to install the Direction Finder we recommend you familiarise yourself with the BTD-200 Lightning Warning System manual.

Physical Installation

Section 4, Sensor Installation, covers the physical installation of the system.

The installation will involve mounting the sensor outside on a pole and running cables to a power source and your site warning system and/or IT system. A general maintenance contractor or electrician will be able to do this work.

Software Update

Section 4.6, covers the software updates.

We have made the installation and update as easy as possible, so if you are generally happy installing software applications the process should not be too difficult.

Use and Maintenance

Section 5, describes how the Direction Finder operates within the BTD-200 system. This section should be read by the person responsible for operating the system.

Maintenance requirements are discussed in Section 6, Maintenance.

2 General Information

2.1 Equipment covered in this manual

| | |
|---------------------------------|---|
| BTD-200 Direction Finder | Direction Finder accessory for the BTD-200 Lightning Warning system |
| Part Number | BA.024 |

2.2 BTD-200 Direction Finder Description

The BTD-200 Direction Finder allows the BTD-200 sensor to report the direction of lightning flashes in addition to their distance from the sensor. The location of lightning flashes is shown on the Lightning Works software map display as a series of dots which fade with time. The Direction Finder thus allows the BTD-200 system to provide a clear picture of the track of thunderstorms in the area.

2.3 Customer Satisfaction

At Senseca we set our standards high and only your complete satisfaction is acceptable to us. If you believe your experience has not met these standards, we would be grateful if you would contact us, so we can discuss any issues you may have. We are also pleased to hear of any positive experience.

2.4 After Sales Support

Senseca offers support by telephone and email for the lifetime of our products, even if there has been a change of ownership, so please get in touch if you require help. Similarly, if you have any questions about your new equipment, we are only a mouse-click or telephone call away. Our contact details are given below. For your convenience our contact details are also on the label fixed to your equipment.

2.5 Contacting Senseca

If you would like technical assistance, advice or you have any queries regarding the operation of the sensor please do not hesitate to contact us.

Contact us by telephone on: + 44 (0)1275 847787

Contact us by fax on: + 44 (0)1275 847303

Contact us by email at: info.bristol@senseca.com

If you bought your system from a local agent, you may wish to contact them in the first instance. No matter how you got your system Senseca is here to help.

2.6 One year warranty

The BTD-200 Direction Finder comes with a one year limited warranty against defective materials and workmanship. If you have any questions about the warranty, please contact Senseca.

To help us to assist you please be sure to include the following information:

- **Model of equipment**
- **Serial number of equipment**
- **Nature of defect**
- **Your full name, address and contact details**

2.7 If you need to return the Direction Finder

The BTD-200 Direction Finder should give you many years of trouble-free service but in the unlikely event that the equipment proves to be faulty and we have asked you to return the sensor to us please address the equipment to:

Senseca UK Ltd
Unit 8 Harbour Road Trading Estate
Portishead
Bristol BS20 7BL
UNITED KINGDOM

The customer is responsible for the shipping costs.

2.8 CE Certification

All Senseca's BTM sensors comply with the requirements for CE marking. Once installed, it is the user's responsibility to ensure that all connections made to the equipment comply with all Local and National safety requirements.

2.9 Safety

2.9.1 Operating Voltages

This product is intended for use with Non-Hazardous voltages only.
The Direction Finder power is taken directly from the BTM-200 Sensor.
Any attempt to operate the Direction Finder from an alternative power source will make the equipment potentially unsafe.



2.9.2 Inappropriate Use

Use of this product in a manner not described or specified in this manual may result in the protection provided being impaired.



3 SUPPLIED EQUIPMENT

The following equipment is supplied in the Direction Finder carton. Please check the contents carefully and immediately report any missing items to your supplier.

- Direction Finder, mounted on support arm with cable and U-bolt attached
- 2 Black nylon cable ties

4 Sensor Installation

The Direction Finder mounts to BTD-200 sensor mounting pole a little below the sensor. If the Direction Finder is to be installed at the same time as the BTD-200 sensor it is recommended the physical installation of the BTD-200 sensor is performed first. Once the BTD-200 sensor is installed the Direction Finder can be fitted below the sensor before the system wiring is completed.

4.1 Site Selection

It is very important for the successful operation of the BTD-200 sensor and Direction Finder that they are installed at a suitable site. For detailed information on site selection for the BTD-200 sensor please refer to the BTD-200 system manual. Please consider the following additional information when selecting your installation site for systems with a Direction Finder:

- No large ferrous metal objects within 20m (66'). See note 1.
- No electrical power transformers or high voltage supply lines within 30m (98').
- No electric motors or motorised valves within 20m (66').
- No radio transmitters. See note 2.
- No sources of radio frequency interference. e.g. electric arc welding

NOTE

Large ferrous metal objects and buildings with steel frames will distort the local magnetic field which can cause the reported direction to have an offset error. This error can be reduced as explained in section 7.

NOTE

The safe working distance between the Direction Finder and a radio transmitter will depend on the transmission frequency and the strength of the signal. For low to moderate power transmitters a separation distance of 20m (66') is recommended. For high power transmitters, especially at lower frequencies, a greater distance may be required.

4.2 Mounting the Direction Finder

The Direction Finder is supplied attached to the mounting arm with the cable attached. Mount the arm to the pole below the BTD-200 sensor using the supplied U-bolt as shown in Figure 4-1 below. The top of the arm should be at least 260mm (10.5") below the sensor mount to allow room to lower the sensor enclosure for access to the cable terminals.

Ensure the arrow on the side of the **Direction Finder is pointing to True North**. If the Direction Finder is not accurately aligned to North, the reported lightning location will not be correct.

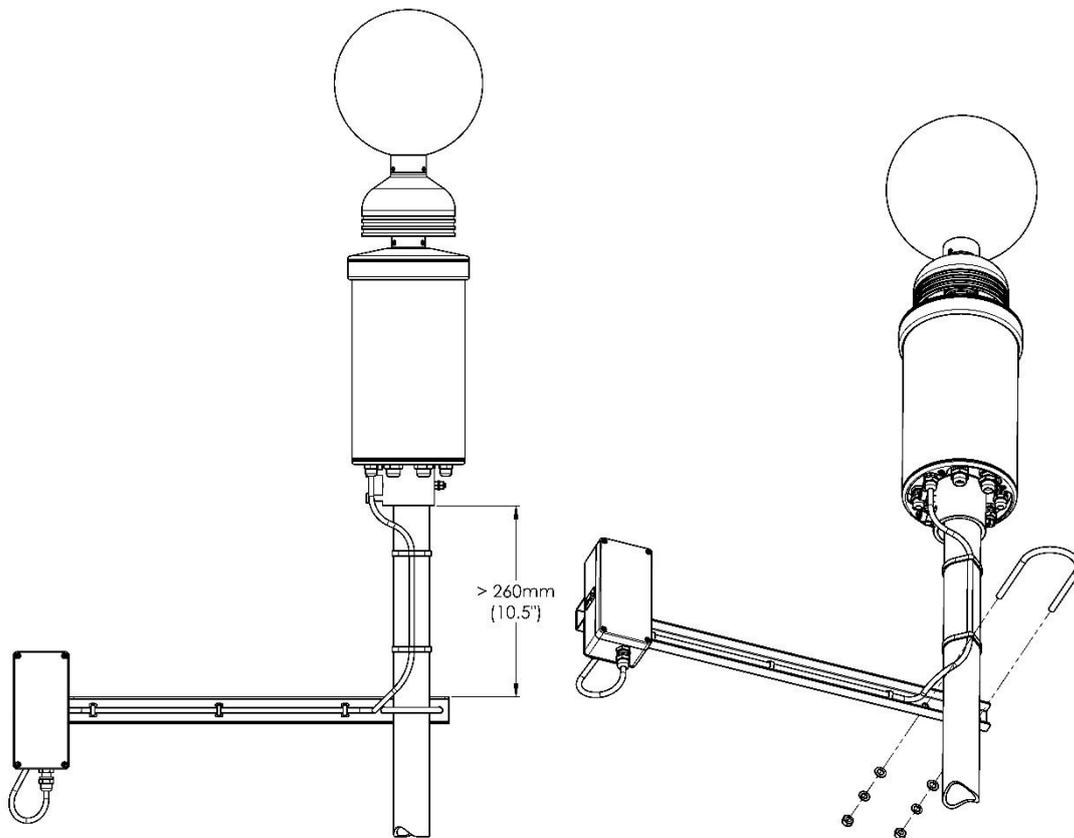


Figure 4-1 Direction Finder Mounting

4.3 Connecting the Direction Finder

Remove the BTD-200 sensor outer cover following the instructions supplied in the sensor manual.

Route the Direction Finder cable through one of the large cable glands on the sensor's base to the terminal board. Take care to avoid looping the cable around the cover's earth strap or you will not be able to refit the cover.

Connect the prepared end of the cable to the Direction Finder terminals shown in Figure 4-2 and the table below.

| Terminal | Wire Colour | |
|------------|---------------------------------|--------|
| A | Brown | Pair 1 |
| B | Black | |
| C | Orange | Pair 2 |
| D | Red | |
| E | Green | Pair 3 |
| F | Yellow | |
| G | Violet | Pair 4 |
| H | Blue | |
| Earth Stud | Cable screen with ring terminal | |

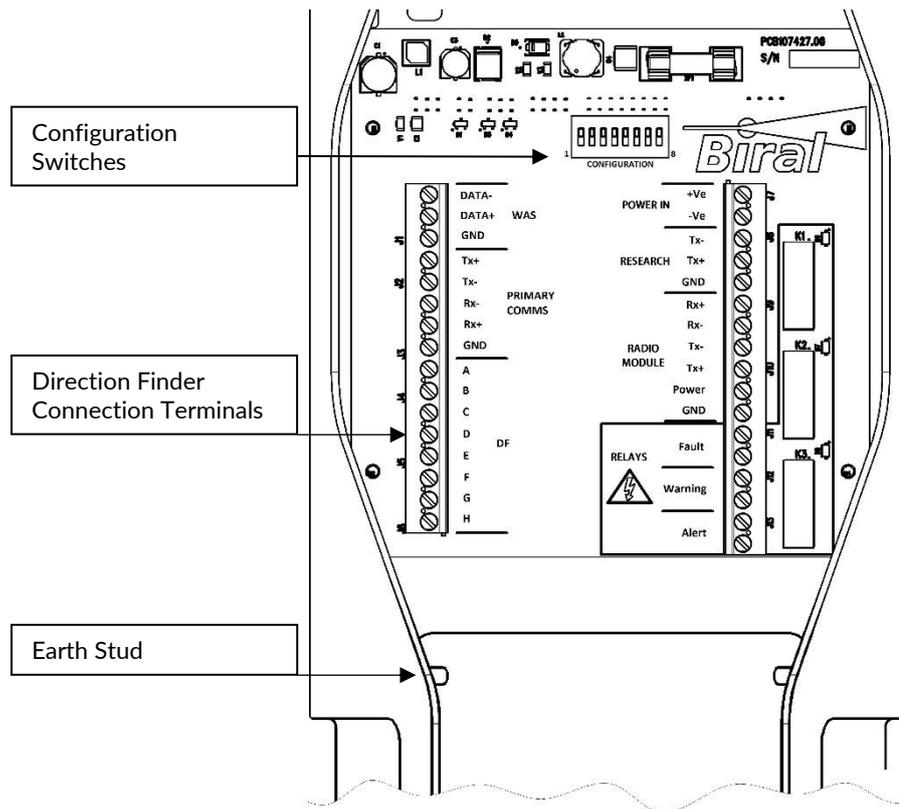


Figure 4-2 Direction Finder Connection Terminals

4.4 Setting Your Configuration

Before the BT-D-200 sensor can operate with the Direction Finder you must set the correct configuration on the Configuration Switches inside the BT-D-200.

With the power to the BT-D-200 disconnected or turned off and the outer cover removed, locate the System Configuration switches on the terminal board. See Figure 4-2. The Configuration Switches are numbered 1 to 8 working from left to right.

When supplied all switches except number 1 will have the rocker pushed up in the closed position, this is the default condition for the BT-D-200 connected to a User Computer and no other system components. Use Table 4-1, below, to set the switch positions for the other components you have in your system. Work through the table from switch 1 to 8 to ensure you have not missed either a component or a method of connection. To select a system component or method of communication push the rocker switch down to the open position.

| Switch Number | | | | | | | |
|----------------------|------------|------------|---------------------------|---------------------------------------|----------------------|---------------------------------|------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| User Computer Fitted | BCB Fitted | WAS Fitted | BT-D-200 has Radio Module | User Computer or BCB has Radio Module | WAS has Radio Module | WAS has wired Connection to BCB | Direction Finder |

Table 4-1 Configuration Switch Settings

For example, if you have a Direction Finder and your BT-D-200 is connected to a User Computer using a Radio Module and there are no other components, the switches should be as follows:

| Switch Number | | | | | | | |
|---------------|--------|--------|------|------|--------|--------|------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Open | Closed | Closed | Open | Open | Closed | Closed | Open |

If you add additional components to your system in the future, you will need to update the configuration settings.

4.5 Completing the Physical Installation

When the steps described in Sections 4.2 to 4.4 have been completed refit the BT-D-200 enclosure following the instructions given in the BT-D-200 sensor manual.

Using the cable ties provided, secure the Direction Finder cable to the mounting pole as shown in Figure 4-1.

The installation is now complete. Power to the BT-D-200 can now be switched on.

4.6 Software Compatibility & Updates

When installing accessories for the BTD-200 it is recommended the BTD-200 sensor software as well as the Lightning Works server and clients are updated to the latest revision.

The latest revisions of software for all components of the BTD-200 system can be downloaded for the Biral website at the following address:

<https://www.biral.com/technical-support/downloads/software-downloads/>

Each download includes step by step instructions to guide you through the software update process.



NOTE

If your BTD-200 sensor is connected to a User Computer using a Radio Module it will not be possible to update the sensor software. To update the sensor software, it is necessary to have a wired connection between primary port and the computer used to perform the software update.

5 Using the Direction Finder

5.1 General

After the Direction Finder has been installed and the system software has been updated the BTD-200 system can be started and used in the normal manner.

5.1.1 Lightning Direction Display

When a Direction Finder is attached the Main tab of the Lightning Works client display will have the distant and vicinity circles divided into eight equal segments. When a lightning strike is detected which generates a Warning or Alert the segment in which the lightning occurred will change colour. Additionally, a black dot will appear to show the location of the lightning strike. The segment colour change will remain until the Warning or Alert clears. The black dots representing the lightning strikes will fade away over the time set by the Flash Display Setting on the User Settings tab.

Located below the Map display area, the Flashes section displays the number of lightning flashes detected for each range band in the last display period. The total number of lightning flashes is displayed along with the number of lightning flashes without direction information. The No Direction section is only displayed when a Direction Finder is attached to the BTD-200. The Flashes section displays information about all flashes in the last 60 minutes, this is the default period but can be changed in the User Settings tab.

5.2 Flashes Without Direction

The BTD-200 sensor detects lightning flashes by observing changes in the electrostatic field around the sensor whilst the Direction Finder detects the radio waves emitted by a lightning flash. Lightning flashes can occur between the cloud and the ground, between clouds or inside a cloud, these three types are often referred to as Cloud to Ground, Cloud to Cloud and Intra Cloud. Cloud to Cloud and Intra Cloud lightning flashes can be much weaker than Cloud to Ground flashes and may not produce radio waves strong enough for the Direction Finder to detect. The electrostatic measurement of the BTD-200 sensor is very sensitive to all types of lightning flashes and so in some cases a flash will be detected but without any direction information.

Lightning flashes without direction do not cause any part of the map display to change colour but they are recorded in the Flashes section of the Main tab.

Lightning flashes without direction are used to generate Warnings and Alerts.

6 Maintenance

The BTD-200 Direction Finder requires no routine maintenance; however, it is recommended the following checks are carried out at least annually to ensure your system continues to work reliably.

6.1 Cables, Corrosion and Fasteners

The Direction Finder is made from glass reinforced plastic and stainless steel so should not corrode; however, we recommend that all mounting hardware and associated fasteners (nuts and bolts) are checked to ensure they are corrosion free and tight.

Check the condition of the cable going to the BTD-200. Ensure the cable is secured so it cannot be damaged by moving around in the wind.

6.2 General Cleaning

It is recommended that any heavy build-up of spider webs or dirt is removed from the Direction Finder. This can be achieved with a brush and water hose as required.

Small amounts of detergent can be used to clean the sensor if desired but make sure the sensor is thoroughly rinsed to remove all traces of detergent.

7 Adjusting the Direction Finder Offset

If the Direction Finder is not correctly aligned to True North or if there are local distortions in the Earth's magnetic field the reported direction may have an offset. The offset is not usually large but may be noticeable when the map display is compared to a lightning location network. The following sections describe how to determine the size of the offset and apply a correction. Where the local magnetic field is distorted the correction may not remove completely the offset for all reported directions.

7.1 Finding the Actual Lightning Direction

There are several options to independently find the actual direction to lightning, some of the best are detailed below. You can find the lightning direction reported by the BTD-200 for each flash in the Activity Log section of the Main tab.

For all the methods discussed below, to increase confidence of the comparison distances, it is best to compare many flashes and find a typical direction reported by the BTD-200 Direction Finder and the independent method. Always make sure that you are comparing lightning flashes detected by the BTD-200 and an independent method which occurred at the same time.

7.1.1 National Lightning Location Network

Lightning detection by a national lightning location network is usually the best option for locating lightning flashes as you can see individual flashes in near real-time. This service can normally be found on your national weather service website or good quality lightning data sites such as www.lightningmaps.org.

Identify individual flashes that are shown by both the BTD-200 and the lightning location network and record the direction reported by the BTD-200 and the direction from the BTD-200 to the flash as shown on the lightning location network. For best results choose a small localised storm and average the BTD-200 direction and lightning network direction for several flashes.

To determine the direction of the flash as reported by the lightning network it may be necessary to printout the lightning network's map display and then measure the direction between North and flashes at the sensor's location. The direction is measured clockwise from North at the sensor's location to the flash reported by the lightning network.

Where possible combine the results from several storms in different directions around the BTD-200. For each flash subtract the BTD-200 direction from the lightning network direction. Calculate the average difference between the BTD-200 direction and that of the lightning network to obtain the offset value.

7.1.2 Rain Radar

If the storm is small and isolated, use an online rain radar site, normally available from your national weather service, to find the heaviest precipitation. This is normally where the lightning is found.

Average the direction reported by the BTD-200 for several lightning flashes and estimate the direction from the BTD-200 location to the heart of the storm on the rainfall radar. The direction is measured clockwise from North at the sensor's location to the flash reported by

the lightning network. Subtract the average BTD-200 direction from the estimated direction taken from the rain radar to obtain the offset value.

Where possible combine the results from several storms in different directions around the BTD-200.

7.2 Entering the Direction Finder Offset

The Direction Finder offset is entered in the Direction Finder Offset section of the Administrator tab of the Lightning Works client software. Details of how to enter the offset are given BTD-200 sensor manual.

8 Specifications

8.1 Measurement

| | |
|-----------|---------------|
| Direction | Resolution 1° |
|-----------|---------------|

8.2 Power Requirements

| | |
|-------------------|---------------------------|
| Supply Voltage | Powered by BTD-200 Sensor |
| Power Consumption | Less than 3 W (DC) |

8.3 Environmental

| | |
|-----------------------|-------------------------------|
| Operating temperature | -20°C to 50°C |
| Relative humidity | 0 to 100% |
| Protection rating | IP66 |
| Wind speed | 60 m/s |
| Altitude | -200m to 2,000m |
| Shock and vibration | Land based fixed installation |

8.4 Certification and Compliance

| | |
|--|--|
| CE marked | |
| EMC | EN61326-1:2013 Industrial immunity, industrial emissions |
| Compliance with EN50536:2011+A1:2012 for a Class 1 detector | |
| Performs in accordance with IEC 62793 for a Class A detector | |
| RoHS and WEEE compliant | |

8.5 Physical

| | |
|--|---|
| Material | Stainless steel, glass filled epoxy plastic |
| Colour | Silver, grey |
| Weight | 1.4kg, 3lbs Sensor and mounting bracket |
| Height | 220mm, 8.6" |
| Width | 90mm, 3.5" |
| Max Distance from mounting pole centre | 537mm, 21.1" |

8.6 Maintenance

| | |
|---------------------|------------------|
| Selftest capability | Standard feature |
| Visual inspection | 6 to 12 months |
| Warranty | 1 year |

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WARRANTY

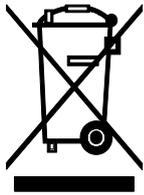
The manufacturer is required to respond to the "factory warranty" only in those cases provided by the Consumer Rights Act 2015. Each instrument is sold after rigorous inspections; if any manufacturing defect is found, it is necessary to contact the distributor where the instrument was purchased from. During the warranty period (12 months from the date of invoice) any manufacturing defects found will be repaired free of charge. Misuse, wear, neglect, lack or inefficient maintenance as well as theft and damage during transport are excluded. Warranty does not apply if changes, tampering or unauthorized repairs are made on the product.

The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product.

TECHNICAL INFORMATION

The quality level of our instruments is the result of the continuous product development. This may lead to differences between the information reported in the manual and the instrument you have purchased. We reserve the right to change technical specifications and dimensions to fit the product requirements without prior notice.

DISPOSAL INFORMATION



Electrical and electronic equipment marked with specific symbol in compliance with 2012/19/EU Directive must be disposed of separately from household waste. European users can hand them over to the dealer or to the manufacturer when purchasing a new electrical and electronic equipment, or to a WEEE collection point designated by local authorities. Illegal disposal is punished by law.

Disposing of electrical and electronic equipment separately from normal waste helps to preserve natural resources and allows materials to be recycled in an environmentally friendly way without risks to human health.



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